

A PURE MILK SUPPLY.

THE importance of a supply of pure and wholesome milk can hardly be exaggerated, and during the last few years much has been done to ensure this by the education of the producer, and by the formulation of regulations by the health authorities. Contamination may take place at four stages:—(1) the cow may be unhealthy, *e.g.* tuberculous; (2) the condition of the farm and milkers and the methods employed may be unsatisfactory; (3) contamination may take place in transit; or (4) during or after sale to the consumer.

In dealing with some phases of this subject, a practical acquaintance with trade conditions is necessary, or impracticable regulations may be imposed. Thus, in a paper read by Mr. Primrose McConnell before the Royal Society of Arts,¹ reference was made to the exaggerated ideas of some sanitarians as to the cubic and floor spaces required in the byres, and, as the author remarked, if the ventilation is properly arranged for, the mere air-space in a shed is a subordinate matter.

The arm-chair sanitarian is apt to forget that one milking has to be done in the early hours of the morning—in winter in dark and cold—that disinfectants, clean smocks, and hot water may be unattainable luxuries, that in many cases all that can be hoped for is the promulgation of the doctrine of general cleanliness, and that to insist on liberal air-space and various structural conditions in the cowsheds may mean an outlay which will render the production of the milk too costly to give an adequate return to the farmer. Far be it from the writer to suggest that ideal conditions should not be formulated and put into practice whenever possible, but in all cases the regulations should be drawn up with the help of trade experts, and with a due regard to the conditions of the district.

No doubt the conditions of supply which formerly obtained, and perhaps to some extent still exist, in some of the smaller farms are much to be deprecated, but a great deal has been done, particularly by the large dairy companies of the metropolis, to remedy this. The problem of transit is still one that requires much attention; the ordinary milk churn is a dirt and dust trap by which much contamination may be introduced into the milk, and refrigerator vans need to be provided by the railway companies. The ordinary method of serving milk with a dipper, and the manner in which milk in bowls is allowed to stand on the counter by the smaller vendors amid a heterogeneous collection of other goods, are in urgent need of alteration.

To some statements made by Mr. McConnell in the paper referred to the writer would take exception. Thus, the existence of large numbers of microbes in milk, provided none was definitely pathogenic, was considered to be of no importance. But large numbers of microbes generally indicate dirty production, which in its turn facilitates the entrance of harmful bacteria. Moreover, milk swarming with microbes may in some cases produce gastro-intestinal disturbance. Tuberculin was considered to be of no value, but veterinary authorities in all countries are unanimous in regarding it as of the greatest value in the detection of tuberculosis. The careful work of the commissioners of the Royal Commission on Tuberculosis on the transmission of bovine tuberculosis to man cannot be summarily dismissed by the statement that "their far-fetched experiments and tests have not proved it to the satisfaction of many people who understand the matter just as well as they do."

R. T. H.

¹ "London Milk Supply from a Farmer's Point of View" (Journ. Roy. Soc. of Arts, December 18, 1908, p. 83).

THE DENSITY OF GASES IN RELATION TO THE ATOMIC WEIGHT OF NITROGEN.

THE fourth and last instalment of the current volume of the well-known Geneva Society's Transactions, referred to below,¹ has a special interest for the chemist and physicist from the fact that it is wholly made up of a series of communications from the laboratory of chemical physics of the University of Geneva under the direction of Prof. Ph. A. Guye. The memoirs, five in number, deal with experimental researches on the physicochemical properties of certain gases in relation to the revision of the atomic weight of nitrogen, a problem which has occupied Prof. Guye and his collaborators for some years past. The greater number of the main results have already been seen in abstract in many serial publications. The work before us contains the full memoirs, which are illustrated by carefully executed drawings of the apparatus employed.

The respective titles are:—

I. "Détermination des Densités des Gaz anhydride carbonique, Ammoniac et Protoxide d'Azote par la Méthode du Volumètre." Ph. A. Guye et Al. Pintza.

Annexe I.: "Contrôle des Densités de l'Oxygène et de l'Anhydride sulfureux." A. Jaquerod et Al. Pintza.

Annexe II.: "Essai sur la Détermination du Poids atomique de l'Azote par l'Analyse en Volume du Gaz ammoniac." Ph. A. Guye et Al. Pintza.

II. "Détermination de la Densité de l'Oxyde Azotique par la Méthode des Ballons." Ph. A. Guye et Ch. Davila.

Annexe: "Densité du Gaz acide chlorhydrique." Ph. A. Guye et G. Ter Gazarian.

III. "Sur la Compressibilité de quelques Gaz à O audessous de l'Atmosphère." A. Jaquerod et O. Scheuer.

IV. "Détermination des Pressions et Températures critiques de quelques Gaz." E. Briner.

V. "Résumé général." Ph. A. Guye.

The main results may be thus stated:—

The weights of the normal litre, that is, the weights of a litre of the respective gases at 0°, under a pressure of 1 atmosphere at sea level, under the latitude of 45°, are as follows:—

	Grams
Carbon dioxide	1.9768
Ammonia	0.7708
Nitrous oxide	1.9777
Oxygen	1.4292
Sulphur dioxide	2.9266
Nitric oxide	1.3402
Hydrogen chloride	1.6398

For the values of compressibility and critical constants of these gases, as well as of those of certain methyl derivatives, we must refer to the original memoirs.

The bearing of the observations so far as they are applicable to the question of the atomic weight of nitrogen is discussed by Prof. Guye in an introductory communication. The result is to show that Stas's value of 14.04 is probably too high, as has been shown independently by Gray. The most probable value is 14.01, a number already adopted by the International Committee on Atomic Weights in its last report.

EDUCATION AND EMPLOYMENT.

WE are glad to see that attention is being again directed to problems of the relation between education and national welfare. In his address as president of the Association of Technical Institutions, last year, Sir Norman Lockyer referred to the deplorable national wastage that goes on after children leave the primary school, and pointed out that by permitting the half-time system the State is

¹ "Mémoires de la Société de Physique et d'Histoire naturelle de Genève," vol. xxxv., Fascicule 4, December. (Genève: Georg et Cie., 1908.)

a consenting party to a cause of mental and physical weakness. This, as he remarked, is not a question of party politics—it is simply a question as to whether the nation is content to see the standard of height and the standard of weight of many children being reduced in order that employment of half-timers should be continued. As to the school-leaving age and the need for further education in continuation schools, Sir Norman Lockyer urged that something should be done to show that the real interests of the employers lie in the fact that if the children can be taught how to learn for a little longer time, all those in their employ, at whatever age, will be more useful to them. It was suggested that the Government should be brought into operation in the same way—the same very definite and perhaps rather drastic way—as has been done in Germany. In Germany, as Prof. Sadler shows in the valuable work on “Continuation Schools” edited by him, employers of labour are obliged to grant to all their employees under eighteen years of age attending continuation schools arranged by the Government or the local authority, the necessary time for school attendance as prescribed by the authority in question. Attendances at continuation schools can be made compulsory for male persons under eighteen years of age by the bye-law of a district or town council. Only in five States, representing about one-fourth of the population of the German Empire, is attendance at continuation schools wholly voluntary.

Dealing with the main causes of unemployment and various proposed remedies, the recently published report of the Poor Law Commission provides useful guidance as to a desirable direction for future educational enterprise. The development of continuation schools for boys who have left the elementary school and a modification of the prevailing type of curriculum in primary schools are urged. The report condemns emphatically the widespread evil of employing boys who have just left school in immediately remunerative but uneducative occupations which lead nowhere and provide them with no special knowledge to ensure their employment later in life. The Commissioners

regard with favour the suggestions that boys should be kept at school until the age of fifteen instead of fourteen; that exemption below this age should be granted only for boys leaving to learn a skilled trade; and that there should be school supervision until sixteen, and replacing in school of boys not properly employed.

Experience has shown that a long time may elapse before the recommendations of a Royal Commission are translated into Acts of Parliament, but, in view of the powers given to Scottish school boards by the recent Education Act for Scotland, it may be hoped that it will not be long before something is done to give the English boy from the elementary school an education and training in his teens which will ensure his becoming a skilled worker when manhood is reached.

The Commissioners, we are glad to note, have not ignored the necessity for providing during the years of adolescence suitable technical instruction for the boys upon whose ability as skilled artisans our industrial efficiency as a nation will in the future depend. The report insists that

There is urgent need of improved facilities for technical education after the present age for leaving school. With a view to the improvement of physique, a continuous system of physical drill should be instituted, which might be commenced during school life, and be continued afterwards; and, in order to discourage boys from entering uneducative occupations which offer no prospect of permanent employment, there should be established, in connection with the

Labour Exchange, a special organisation for giving boys, parents, teachers, and school managers information and guidance as to suitable occupations for children leaving school.

We can imagine no more effective method of reducing in future years the ranks of the unemployed than that recommended in the report. The problem is first to educate the parents to forego the advantage of their boys' immediate earnings—providing them with some solatium, if necessary—and then to provide the boy with suitable employment which will enable him to learn a trade, and to be a skilled worker in his manhood. To convert him into a competent artificer it is necessary to see that the boy attends the technical school during his apprenticeship, or corresponding years, for a certain number of hours which form part of his working day.

But, as has been pointed out in these columns again and again, the full advantages of a scheme of technical instruction cannot be secured unless the boys attending the classes of the technical institute have received an adequate and suitable education in the elementary school during the years up to fifteen. In the past, the type of curriculum and the general character of the education have been unsuitable for boys who will later become manual workers. The Commissioners have recognised these facts, and they recommend the Board of Education earnestly to consider the necessity for re-modelling the practice and ideals of our elementary schools. To quote the report:—

A considerable amount of evidence has been submitted to us to the effect that the present system of elementary education is not adapted to the wants of an industrial community. There is a consensus of feeling, in which we ourselves concur, that the present education is too literary and diffuse in its character, and should be more practical. It should be more combined than at present with manual training. It is not in the interests of the country to produce by our system of education a dislike of manual work and a taste for clerical and for intermittent work, when the vast majority of those so educated must maintain themselves by manual labour. If school training is to be an adaptation of the child to its future life and occupation, some revision of the present curriculum of public elementary schools seems necessary.

Men of science will welcome this full and generous recognition of the claims of “practical” subjects to take a large part in the education of children who will later constitute our industrial community—a necessity which was urged in the report of the British Science Guild Committee, published in NATURE of January 28 (p. 283). Manual work must be treated with respect, and every effort made to explode the prevalent fallacy that ill-paid and precarious clerical work is more “respectable” than honest, skilled constructive labour.

Since the publication of the report of the Commission an influential and representative deputation has waited upon the Prime Minister on the subject of boy labour, and many of the considerations here passed in review were urged upon the Government. In replying, Mr. Asquith dealt in an illuminating and sympathetic manner with the years between leaving school and reaching manhood—the unbridged gap, as he called it. After endorsing to a large extent the recommendations of the recent report, Mr. Asquith dealt with some of the education difficulties. He said:—

I think the most interesting and suggestive part of the discussion to which we have listened this afternoon has been upon the subject of the exemption, the raising of the age of exemption, and of enlarging the use, perhaps by compulsion, of continuation schools. I am entirely with you, I think, in the most advanced views that have been

offered to-day upon both these matters; but being compelled by the exigencies of the life I lead to deal with these matters in a practical spirit—in other words, to calculate the length, the breadth, and the weight of the obstacles which have to be encountered—the remedy is not quite so easy to discover and to apply as to the more sanguine among us it may, at first sight, appear. For instance, there is this question of raising the age of exemption. There you are confronted with these discouraging figures from the Lancashire operatives, where, upon a poll on the question of raising the half-time age to thirteen, barely 34,000 voted in the affirmative and no less than 150,000 voted in the negative. I agree that a few years ago the figures would have been much more discouraging than they are now. But one hopes that with the advance of information and the efforts of the enlightened leaders like my friend Mr. Shackleton there may be a considerable movement in a better direction. But it is obvious that at the moment it would be extremely difficult to apply by any statutory form of compulsion a measure which, so far as regards the great bulk of the operatives are concerned, a large majority are not prepared voluntarily and spontaneously to accept. That is a case for what is called spade-work, which I hope may produce its results before long. When we come to the question of continuation schools, I think the prospect is more satisfactory and hopeful. We did something for Scottish education in the Scottish Act last year, and I hope it is not too sanguine a view to take if one expresses the hope that England will soon level itself up to the standard of Scotland in that matter. Again there is a difficulty. As one of the speakers pointed out, if the boys or the girls are kept hard at work in a monotonous way at unintellectual occupations during a great many hours of the day, you cannot expect them to bring to the continuation school, or evening school, anything like a fresh intelligence or that power of receptivity which is essential to the efficient working of such institutions. There comes in that question of the half-timer again. I cannot help thinking that if employers of labour would more generally take the course which Sir Albert Spicer has taken, and which Mr. Cadbury has taken, of making it a condition when they employ these young boys and girls in their works that they should spend one or two evenings in a continuation school, their regular hours of labour being so adjusted that it is not an excessive strain either upon their intellectual or physical capacity, we should find, if not a solution, the way of going very near to the solution of that part of the problem.

A report upon the problem of education in relation to apprenticeship, especially as it concerns the children of London, is to be presented by the Higher Education Sub-committee of the London County Council Education Committee at a meeting to be held as we go to press. In this report the committee urges that, inasmuch as industrial training is a national and not a local question, technical institutions and technical scholarships should be supported to a much larger extent than at present out of funds provided by the National Exchequer.

As remedies for what are pronounced defects in our educational methods, leading to waste of effort and the sacrifice of future prospects to immediate needs, the committee makes a number of proposals which are identical in principle with suggestions for an organised educational system contained in the report of the British Science Guild Education Committee already published in these columns. The proposals put forward by the London County Council Committee may be summarised as follows:—

- (1) The age of compulsory attendance at elementary schools should be raised to fifteen.
- (2) Certain children should be transferred at the age of thirteen to trade or craft schools.
- (3) The elementary-school curriculum should be made more practical by a considerable increase in the time devoted to various kinds of manual training.
- (4) Local education authorities should be empowered to compel employers to allow their apprentices and learners

the necessary time during the day to attend classes, and to enforce such attendance on the apprentices and learners.

- (5) At least half the working day should be spent in school.

- (6) All boys and girls not on the rolls of trade or secondary schools should be required to pass through a three years' course of "half-time" instruction at continuation schools.

It is to be hoped that statesmen will not wait until a mandate is received from those who benefit by child-labour before attempting to make our educational demands comparable with those of Scotland and Germany. Their duty is to safeguard the mental and physical welfare of the coming generation if our nation is to be kept in the van of progress. The continuation of the present system involves grave injustice to a not inconsiderable part of the child population of England, for the mental, moral, and physical training received during school life is soon lost after a boy drifts into one of the occupations of unskilled trades. As to further education, whether in day or evening continuation schools, or in secondary schools, there is much to be done before we can approach the conditions existing in Germany. While Germany is fast extending the age of compulsory attendance through the critical years of youth, in England and Wales not more than one in three of the children who leave the public elementary schools at thirteen or fourteen years of age receives any further systematic care as regards education of any kind. When our statesmen realise what a study in contrasts is afforded by the German and English systems of education, and what an inferior position we occupy, judged by any standard of educational measurement, they will perhaps do something to prevent the waste of body and mind which is a source of individual poverty and of national weakness.

SIR GEORGE KING, K.C.I.E., F.R.S.

SIR GEORGE KING, K.C.I.E., F.R.S., whose death at San Remo was announced in NATURE of February 18, was born at Peterhead on April 12, 1840. He was educated at the Grammar School and the University, Aberdeen, graduating in medicine in 1865. In the same year he entered the Indian Medical Service, and was posted to the Bengal Presidency.

Soon after reaching India, King was detailed for military medical duty in Central India and Rajputana, where his leisure was devoted to work of high quality as a field naturalist. From military duty he was transferred to act temporarily as superintendent of the Botanic Gardens at Saharanpur, in Upper India; shortly thereafter he was induced to join the Indian Forest Service, and was placed in charge of the Kumaon forests. While so employed he was selected by the Secretary of State for India as successor to Dr. Thomas Anderson, whose death in October, 1870, had left vacant the superintendship of the Royal Botanic Gardens at Calcutta and of Cinchona Cultivation in Bengal.

When, in 1871, King assumed charge of the Calcutta gardens these were in the ruined condition to which they had been reduced by severe cyclones in 1864 and again in 1867. They had practically to be renovated, and the charm and beauty for which they are famed constitute an adequate memorial to King's energy, patience, and skill as a landscape gardener. The prolonged task involved considerable expenditure, and the readiness with which the necessary funds were supplied bears witness to the traditional enlightenment of the Government of Bengal and to